

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons which follow.

Claims 1, 2, 16, 26, and 32 are currently being amended.

This amendment changes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, are presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-12, 13, 14, and 15-32 are now pending in this application.

The Examiner has rejected claims 26-31 under 35 U.S.C. §112 as containing subject matter not described in the specification. The Examiner rejected claims 1-11 and 16-25 under 35 U.S.C. §102(b) as being anticipated by Ko et al (U.S. Pat. No. 5,781,158). Claims 26-31 were rejected under 35 U.S.C. §102(b) as being anticipated by Sanad (U.S. Patent No. 5,627,550). Claim 32 was rejected under 35 U.S.C. §102(b) as being anticipated by Fukasawa et al. (U.S. Patent No. 5,966,097). Claim 13 was rejected under 35 U.S.C. §103(a) as being unpatentable over Ko et al in view of Smith (U.S. Pat. No. 6,304,222). Claim 14 was also rejected under 35 U.S.C. §103(a) as being unpatentable over Ko et al in view of Lahti (U.S. Pat. No. 6,348,894).

With respect to the §112 rejection, Applicant has amended the specification to include material supported by the disclosure of the material specifically incorporated by reference in the pending application. Thus, no new matter has been added.

In Applicant's invention, for example as illustrated in figure 6, the positioning of the two conductors is such that the current distribution occurs in a substantially circular arrangement. Claim 1 recites an antenna comprising a ground plane, a first conductor having a first length extending longitudinally above the ground plane and having a first end electronically connected to the ground plane at a first location, a second conductor having a second length extending longitudinally above the ground plane and parallel to the first conductor, the second conductor having a first end electrically connected to the ground plane at a second location, an antenna feed coupled to the first end of the first conductor wherein the first conductor, the second conductor, the ground plane, and the antenna feed are positioned to create a current distribution having a substantially circular cross-section wherein the first and second conductors are equidistant from the ground plane.

In contrast, Ko does not teach or suggest a structure that produces a substantially circular current distribution. As the Examiner characterized Ko as follows:

The Ko et al reference teaches in figure 6 an antenna comprising: a ground plane 11a; a first conductor 15a having a first length extending longitudinally above the ground plane and having a first end electrically connected to the ground plane 11a at a first location; a second conductor 15b having a second length extending longitudinally above the ground plane and parallel to the first conductor, the second conductor having a first end electrically connected to the ground plane at a

second location; an antenna feed 16 coupled to the first conductor 15a; wherein the first and second conductors are equidistant from the ground plane (figure 6). The first and second conductors are both disposed on a single substrate 14a. The single substrate comprises a flexible printed circuit substrate. The first length is approximately equal to the second length (figures 9, 14, 19, and 23). The first location is spaced apart from the second location by a distance approximately equal to the first length. The first and second conductors 13d comprise a first antenna element and further comprising a second antenna element having a third conductor 15g and a forth conductor 15g (figure 14). The second antenna element is a parasitic element. The first and second antenna elements are parallel to each other (figure 14). The first and second antenna elements are non-parallel to each other (figure 19). The third and forth conductors 15i are equidistant from the ground plane at a distance equal to a distance between the first and second conductors and the ground plane (figure 19). The third and fourth conductors are equidistant from the ground plane at a distance different from a distance between the first and second conductors and the ground plane (figure 14). An electronic device has a housing and wherein the ground plane is adjacent to the first surface of the housing and the first and second conductors are adjacent to a second surface of the housing (col. 1, lines 17-18). The first and second conductors are arched above the ground plane.

One of ordinary skill in the art would not be instructed by Ko to utilize an antenna that produces a circular current distribution. The electric field of Ko is restricted to the area between the ends of the conductors; thus creating a current distribution that is substantially planar along the length of the conductors. In contrast, in Applicants' invention the electric field is located along the long edge of the conductor where the two conductors overlap creating a substantially circular current distribution. Ko describes an antenna which maximizes isolation at the expense of bandwidth. In contrast, Applicant's invention provides a broader bandwidth, with the capability to vary the bandwidth and isolation qualities by altering the space between the first and second conductors. Applicants' invention provides for a less restrictive confinement of the electric field, thereby greatly improving the bandwidth while maintaining reasonably good isolation.

Since Ko fails to disclose or teach an antenna feed connected to a first end of the first conductor such that the positioning of the first conductor, second conductor, ground plane, and antenna feed create a substantially circular current distribution as claimed in claims 1-25 of the present invention, Applicant respectfully submits that the rejections regarding claims 1-25 have been overcome.

The Examiner also rejected claims 26-31 under 35 U.S.C. §102(b) as being anticipated by Sanad (U.S. Pat. No. 5,627,550). Claim 26 has been amended to more distinctly claim the subject matter of the Applicants' invention.

Applicant's invention as claimed in claim 26 is an antenna comprising a ground plane, a generally "U"-shaped conductor having the first and second parallel legs lying in a plane spaced apart from the ground plane, an antenna feed coupled to a first end of the first leg, a ground point, separate from the antenna feed, coupled to the first end of the first leg, a short between the ground plane and at least one of the first and second legs; and wherein the conductor, ground

plane, the ground point, and antenna feed are shaped and positioned to create a current distribution having a substantially circular cross-section.

In contrast, Sanad does not teach or suggest a structure that produces a substantially circular current distribution. The Examiner characterized Sanad as follows:

The Sanad reference teaches in figure 14 an antenna comprising: a ground plane 88; a generally “U” shaped conductor 84 having first and second parallel legs lying in a plane spaced apart from the ground plane 88; an antenna feed 34 coupled to a first end of the first leg; a short 84b between the ground plane and at least one of the first and second legs. The short extends from the ground plane to the first end of the first leg (figure 14). Figure 14 shows a parasitic antenna element 86 in proximity to the “U”-shaped conductor 84. The parasitic antenna element 86 is disposed to a side of the “U” shaped conductor. The parasitic element is disposed between the plane of the “U”-shaped conductor and the ground plane. The parasitic antenna element comprises a first conductor 82 having a first length extending longitudinally above the ground plane 88 and having a first end 82b electrically connected to the ground plane 88, a second conductor 86 having a second length extending longitudinally above the ground plane and parallel to the first conductor 82, the second conductor 86 having a first end 86b electrically connected to the ground plane 88, wherein the first and second conductors are equidistant from the ground plane (figure 14).

One of ordinary skill in the art would not be instructed by Sanad to utilize an antenna that produces a circular current distribution. Sanad describes an antenna where the electric field is confined within the volume of the antenna. However, the Applicants’ invention provides for a less restrictive confinement of the electric field, thereby greatly improving the bandwidth while maintaining reasonably good isolation. The antenna in accordance with the principles of the Applicants’ invention produces an electric field that lies in the plane defined by the legs of the “U” shaped conductor and a magnetic field that is orthogonal to both the ground plane and the electric field. Applicants’ invention as claimed in claim 26 includes a conductor, ground plate, ground point, and antenna feed shaped and positioned to product circular current, part of which propagates through the capacitive portion of the antenna and part of which propagates through the inductive portion of the antenna.

Furthermore, Sanad does not teach the “U” shaped conductor of the claim 26. The Examiner has incorrectly equated the conductor (84) of Sanad as being a “U” shaped structure. The conductor of Sanad is not “U” shaped nor does the conductor have parallel legs. The antenna of Sanad utilizes separate elements not connected as required by the Applicants’ specification and by the plain meaning of the use of the term “U” shaped.

Applicants respectfully submits that the rejections regarding claims 26-31 have been overcome.

Applicant has also amended claim 32 to include an antenna feed coupled to the first end of the first conductor. Claim 32 claims an antenna comprising a ground plane; a first conductor having a first length extending longitudinally above the ground plane and having a first end and a

second end, the first end electrically connected to the ground plane at a first location; a second conductor having a second length extending longitudinally above the ground plane and parallel to the first conductor, the second conductor having a first end and a second end, the first end positioned opposite the first end of the first conductor and electrically connected to the ground plane at a second location, the second end of the second conductor extended longitudinally beyond the second end of the first conductor; an antenna feed coupled to the first end of the first conductor; wherein the first and second conductors are equidistant from the ground plane and wherein the ground plane, the first conductor, the second conductor, and the antenna feed are positioned to create a substantially circular current distribution. The antenna of claim 32, as seen in Figure 5, is directed to an antenna having at least two conductive elements which define a conductor plane. The elements are equidistant from the ground plane and parallel, with opposite ends connected to the ground plane. The elements extend longitudinally so that they each have a portion that is adjacent to the other in the conductor plane. In addition, the arrangement of the ground plane, first conductor, second conductor, and antenna feed create a substantially circular current distribution. Applicant submits that neither Ko, Sanad, Fukasawa (which has an antenna feed connected along the length of a conductor and thus does not produce a substantially circular current distribution) nor any of the prior art cited teach an antenna where the arrangement of the ground plane, first conductor, second conductor, and antenna feed create a substantially circular current distribution.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 50-0872. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 50-0872. If any extensions of time are needed for timely acceptance of papers submitted herewith, applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 50-0872.

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